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THE EFFECT OF STAGE OF MATURITY ON THE NUTRITIVE VALUE OF SMOOTH BROMEGRASS AND EASTERN GAMAGRASS SILAGES

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Summary

Early- and late-harvested smooth bromegrass and eastern gamagrass silages and fourth-cutting alfalfa silage were compared in two, 20-day voluntary intake and digestion trials. Visual appraisal and pH values indicated that all five forages were well preserved as silage. Voluntary intake tended to be higher for sheep fed bromegrass and alfalfa silages compared to those fed gamagrass silages. The late-harvested gamagrass silage had the lowest DM intake in both periods. Dry matter, crude protein, and neutral detergent fiber digestibilities were generally similar for the two grasses within the early- and late-harvested silages. Chemical analyses indicated that the two bromegrass silages were of nearly equal nutritive value; however, digestion trial results showed that the early-harvested silage was higher in quality than the late-harvested silage. Results of both chemical analyses and digestion trials showed that the early-harvested gamagrass silage was higher in quality than the late-harvested silage.

(Key Words: Grass, Smooth Brome, Eastern Gama, Silage.)

Introduction

Smooth bromegrass is a cool-season perennial found throughout most of the northern United States. It is used primarily as a pasture or hay crop in northern and eastern Kansas. Eastern gamagrass is a warm-season perennial bunch grass found from Texas to Kansas and east to New England. Because of difficulties in establishment, gamagrass has received little commercial attention or on-farm use until recently. Virtually no controlled experiments have looked at the ensiling traits of these two grasses.

Our objective was to determine the ensileability and nutritive value of smooth bromegrass and eastern gamagrass when ensiled at two stages of maturity. Alfalfa silage was used for comparison.

Experimental Procedures

In the summer of 1995, smooth bromegrass and eastern gamagrass were swathed with a New Holland mower-conditioner; wilted for approximately 24 hours; chopped using a FieldQueen forage harvester; and ensiled in 55 gallon, polyethylene-lined, pilot-scale silos. Both grasses were harvested at approximately the heading and flowering stages of maturity—June 12 and July 11 for the bromegrass and June 21 and July 12 for the gamagrass. The smooth bromegrass plot was located at the Kansas State University Sheep Teaching and Research Unit in Manhattan, and the eastern gamagrass plot was located at the Kansas State University Department of Agronomy Research Farm in Manhattan. The bromegrass and gamagrass plots received 100 lb of nitrogen per acre as ammonium nitrate on May 2. The fourth cutting alfalfa was in the bud stage of maturity and provided by Bert and Wetta of Abilene, Kansas. It was harvested similarly to the two grasses and ensiled after a 24-hour wilting period on September 17. All preensiled forages were treated with Pioneer® brand 1174 inoculant to supply 150,000 cfu of lactic acid bacteria per gram of fresh material.

Because of a limited supply of forage, sheep were used as model animals. Each silage was fed to four Ramboillet crossbred wether lambs (avg wt. of 69.5 lb) in two, 20-day voluntary intake and digestion trials. Rations contained 90% silage and 10% supplement (DM basis). After a 7-day ration adaption, voluntary DM intake was measured for 7 days. The lambs then were fed 85% of their average voluntary DM intake during the subsequent 6-day digestion trial.

Results and Discussion

Results are presented in Table 1. Weather conditions were excellent (warm temperatures and low humidities) for each of the five 24-hour, field-wilting periods. As expected, the standing, preswathed, early-harvested grasses had a lower DM content than the standing, late-harvested grasses. Visual appraisal and pH values indicated that all five forages were well preserved as silage.

Voluntary DM intake tended to be higher for sheep fed bromegrass and alfalfa silages compared to those fed gamagrass silages. The late-harvested gamagrass silage had the lowest (P<.05) DM intake in both periods, which was likely due to the high NDF content of the silage (71.7%). The late-harvested bromegrass silage had an unexpectedly high DM intake in the second period, which resulted in a silage × period interaction for DM intake. Alfalfa silage had the highest (P<.05) DM and CP digestibilities in both periods, and the late-harvested bromegrass silage had the lowest (P<.05) ADF digestibility in both periods. This high DM intake of the late-harvested bromegrass silage was likely responsible for its very low NDF and ADF digestibilities. Grass silage × period interactions also were observed for DM, CP, and NDF digestibilities.

Chemical analyses indicated that the two bromegrass silages were of nearly equal nutritive value; however, digestion trial results clearly showed that the early-harvested silage was higher in quality than the late-harvested silage. Results of both chemical analyses and digestion trial results showed that the early-harvested gamagrass silage was higher in quality than the late-harvested silage.

Table 1. pH and Chemical Composition of the Five Silages and Nutritive Value of the Five Silage Rations in Periods 1 and 2

	Early-Harvested		Late-Harvested		Fourth-Cutting
Item	Brome	Gama	Brome	Gama	Alfalfa
Silage composition					
Dry matter[1], %	44.0	42.7	53.8	51.9	46.8 (24.5)
pH	4.18	4.27	4.40	4.68	4.64
	% of the silage DM				
CP	8.8	10.8	9.0	7.9	21.9
NDF	60.9	66.4	61.2	71.7	30.7
ADF	34.5	34.9	35.1	38.4	22.5
Voluntary intake,	Period 1				
g/metabolic body wt. ($kg^{.75}$)	40.6^{b}	38.9^{b}	39.2^{b}	33.2^{c}	45.7^{a}
	Digestibility, % of the ration				
DM	54.5^{b}	54.5^{b}	50.0^{c}	48.0^{c}	69.1^{a}
CP	48.1^{c}	55.3^{b}	43.3^{d}	45.7^{cd}	75.0^{a}
NDF	54.7^{a}	55.7^{a}	47.6^{c}	48.4^{bc}	$51.5^{a,b}$
ADF	$48.8^{a,b}$	50.7^{a}	41.8^{c}	46.2^{b}	50.7^{a}
Voluntary intake,	Period 2				
g/metabolic body wt. ($kg^{.75}$)	38.9^{b}	36.1^{b}	45.2^{a}	30.8^{c}	47.4^{a}
	Digestibility, % of the ration				
DM	55.7^{b}	54.0^{c}	43.1^{d}	50.0^{c}	73.2^{a}
CP	40.1^{c}	50.4^{b}	37.6^{d}	34.4^{d}	70.1^{a}
NDF	53.1^{a}	53.3^{a}	37.2^{b}	51.3^{a}	54.5^{a}
ADF	46.8^{b}	$49.5^{a,b}$	32.1^{c}	$49.8^{a,b}$	56.1^{a}

[1]The DM content of the standing, preswathed forage is shown in parenthesis.
[a,b,c]Means on the same line with different superscripts differ (P<.05).